

WHAT IS CLAIMED IS:

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917* 1. A shock- and vibration-absorbing system comprising:

a first plate assembly attachable to a first structure,

a second plate assembly attachable to a second structure, and

5 a plurality of cavernous members of an elastic material;

wherein the first plate assembly and the second plate assembly together form at least one cavity having an initial volume in which the plurality of cavernous members are arranged;

wherein, after attachment of the first plate assembly to the first structure and the

10 second plate assembly to the second structure, shock and vibration passing between the first structure and the second structure cause the first plate assembly and the second plate assembly to move relative to each other to reduce the initial volume of the at least one cavity so as to compress the plurality of cavernous members; and

wherein compressing the plurality of cavernous members exerts pressure against the

15 first plate assembly and the second plate assembly so as to absorb the shock and vibration.

2. The system of claim 1, wherein the first plate assembly includes a plurality of first pocket plates, each first pocket plate having at least one hole forming a first pocket, the first pockets of the plurality of first pocket plates overlapping one another so as to form the at least one cavity in conjunction with the second plate assembly.

3. The system of claim 2, wherein the second plate assembly includes a plurality of second pocket plates, each second pocket plate having at least one hole forming a second pocket, the second pockets of the plurality of second pocket plates overlapping one another so as to form the at least one cavity in conjunction with the first pockets of the plurality of first pocket plates of the first plate assembly.

4. The system of claim 3, wherein the first plate assembly includes at least one first plate end attached to the plurality of first pocket plates, and the second plate assembly includes at least one second plate end attached to the plurality of second pocket plates.

5. The system of claim 1 further comprising at least one side surface;

wherein the first plate assembly includes a first surface and the second plate assembly includes a second surface;

wherein the at least one cavity is defined by the first surface, the second surface, and the at least one side surface;

wherein the first plate assembly includes a plurality of first rods, each first rod having an attached end attached to the first structure, a free end terminating beyond the second surface, a first brace arranged outside the at least one cavity towards the first structure and a second brace arranged outside the at least one cavity towards the second structure;

5 wherein the second plate assembly includes a plurality of second rods, each second rod having an attached end attached to the second structure, a free end terminating beyond the first surface, a first brace arranged outside the at least one cavity towards the first structure and a second brace arranged outside the at least one cavity towards the second structure; and

10 wherein the first surface and the second surface are free to slide in relation to the plurality of first rods and the plurality of second rods prior to the arrangement of the cavernous members in the at least one cavity.

6. The system of claim 5 further comprising a primary positioning system, the primary positioning system having a first end in contact with the first plate assembly and a second end in contact with the second plate assembly, the first end and the second end pressing against the first plate assembly and the second plate assembly to maintain the initial volume of the at least one cavity;

15 wherein the primary positioning system providing a preloaded resistance against the first plate assembly and the second plate assembly so as to prevent relative movement between the first plate assembly and the second plate assembly when the primary positioning system experiences shock and vibration weaker than the preloaded resistance.

20 7. The system of claim 6, wherein the primary positioning system includes at least one nitrogen gas die spring.

8. The system of claim 1, wherein the first plate assembly is made primarily of one of wood, rigid plastic, metal, ceramics, graphite, fiberglass, concrete and stone.

25 9. The system of claim 1, wherein the elastic material includes at least one of rubber, polyurethane, polyvinyl, polyethylene, and polypropylene.

10. The system of claim 1, further comprising a primary positioning system, the primary positioning system having a first end in contact with the first plate assembly and a second end in contact with the second plate assembly, the first end and the second end pressing against the first plate assembly and the second plate assembly to maintain the initial volume of the at least one cavity;

30 wherein the primary positioning system providing a preloaded resistance against the first plate assembly and the second plate assembly so as to prevent relative movement

between the first plate assembly and the second plate assembly when the primary positioning system experiences shock and vibration weaker than the preloaded resistance.

11. The system of claim 10, wherein the primary positioning system is arranged within the at least one cavity.

5 12. The system of claim 10, wherein the primary positioning system includes at least one nitrogen gas die spring.

10 13. The system of claim 1, further comprising a shelving assembly comprising:
an outer structure connected to the first plate assembly,
an inner structure within the outer structure and connected to the second plate assembly, and

wherein the inner structure is suspended by the second plate assembly within the outer structure.

15 14. The system of claim 13, wherein the outer structure includes a cabinet and the inner structure includes a frame.

16. The system of claim 13, the shelving assembly further comprising a track system between the outer structure and the inner structure.

20 16. The system of claim 15, wherein the track system includes at least one track, each at least one track having a corner post fixedly attached to the outer structure and a vertical sliding rail attached to the inner structure and slidably engaging the corner post.

17. The system of claim 16, wherein the at least one track includes a plurality of truck assemblies attached to the vertical sliding rail and mounted within the corner post, the plurality of truck assemblies forming an interface between the vertical sliding rail and the corner post.

25 18. The system of claim 17, wherein each of the plurality of truck assemblies includes a truck and a truck adjuster attached to the truck, the truck adjuster serving to center the truck in the corner post.

19. The system of claim 13, further comprising a primary positioning system, the primary positioning system having a first end in contact with the first plate assembly and a second end in contact with the second plate assembly, the first end and the second end pressing against the first plate assembly and the second plate assembly to maintain the initial volume of the at least one cavity;

30 wherein the primary positioning system providing a preloaded resistance against the first plate assembly and the second plate assembly so as to prevent relative movement

between the first plate assembly and the second plate assembly when the primary positioning system experiences shock and vibration weaker than the preloaded resistance.

20. The system of claim 19, wherein the primary positioning system includes at least one nitrogen gas die spring

5 21. A method of attenuating shock and vibration between a first structure and a second structure, the method comprising the following steps:

bringing a first plate assembly and a second plate assembly together to form at least one cavity having an initial volume;

10 arranging a plurality of cavernous members of an elastic material in the at least one cavity;

Act
uniting the first plate assembly and the first structure;

uniting the second plate assembly and the second structure; and

allowing shock and vibration to cause the first plate assembly and the second plate assembly to move relative to each other to reduce the initial volume of the at least one cavity so as to compress the plurality of cavernous members;

15 wherein compressing the plurality of cavernous members exerts pressure against the first plate assembly and the second plate assembly so as to absorb the shock and vibration.

22. The method of claim 21, further comprising

securing a first end of a primary positioning system against the first plate assembly;

20 and

securing a second end of the primary positioning system against the second plate assembly;

wherein the primary positioning system provides a preloaded resistance against the first plate assembly and the second plate assembly so as to prevent relative movement between the first plate assembly and the second plate assembly when the primary positioning system experiences shock and vibration weaker than the preloaded resistance.

25 23. The method of claim 21, further comprising:

uniting the first plate assembly and an outer structure; and

suspending an inner structure from the second plate assembly within the outer

30 structure.

24. The method of claim 23, further comprising:

securing a track system between the outer structure and the inner structure.

25. The method of claim 24,
wherein the track system includes at least one track, each at least one track having a
corner post and a vertical sliding rail; and
wherein securing the track system between the outer structure and the inner structure
5 includes the following steps:
fixedly attaching the corner post to the outer structure;
fixedly attaching the vertical slide rail to the inner structure; and
slidably engaging the vertical slide rail with the corner post;
wherein the inner structure may slide up and down the at least one track while
10 connected to the vertical sliding rail.

26. The method of claim 25,
wherein the at least one track further includes a plurality of truck assemblies;
the method further comprising:
attaching the plurality of truck assemblies to the vertical sliding rail and
15 mounting the plurality of truck assemblies within the corner post, the plurality of
trucks being an interface between the vertical sliding rail and the corner post.

27. The method of claim 26,
wherein each of the plurality of truck assemblies includes a truck and a truck adjuster,
the method further comprising:
attaching the truck adjuster to the truck, and
20 adjusting the truck adjuster to center the truck in the corner post.

28. A shock- and vibration-absorbing system comprising:
a first support device,
a second support device movably juxtaposed to the first support device, and
25 at least one elastic member;
wherein the first support device and the second support device together form at least
one cavity having an initial volume in which the at least one elastic member is arranged, and
wherein movement of the second support device relative to the first support device causes the
at least one cavity to have a compressed volume less than the initial volume.

30 29. A shock- and vibration-absorbing system comprising:
a first containment means,
a second containment means movably juxtaposed to the first containment means and
complementing the first containment means, and

a compressible medium;

wherein the first containment means and the second containment means together form at least one contained cavity having an initial volume in which the compressible medium exists, and wherein movement of the second containment means relative to the first containment means causes the at least one contained cavity to have a compressed volume less than the initial volume.

30. The system of claim 29, further comprising:

a shock- and vibration-absorbent shelving assembly comprising:

an outer structure connected to the first containment means,

10 an inner structure within the outer structure and connected to the second containment means, and

wherein the inner structure is suspended by the second containment means within the outer structure.

31. A method of attenuating shock and/or vibration between a first structure and a second structure, the method comprising:

15 forming at least one cavity having an initial volume by combining a first support device and a second support device so that the first support device and the second support device may move with respect to each other to reduce the initial volume of the at least one cavity;

20 arranging at least one elastic member in the at least one cavity;

attaching the first support device to the first structure; and

attaching the second support device to the second support structure.

32. A method of attenuating shock and/or vibration between a first structure and a second structure, the method having a response to an inward force of a given magnitude equivalent to the response to an outward force of the given magnitude, the method comprising:

25 forming at least one cavity having an initial volume by combining a first containment means and a second containment means so that the first containment means and the second containment means may move with respect to each other to reduce the initial volume of the at least one cavity;

30 arranging a compressible medium in the at least one cavity;

attaching the first containment means to the first structure; and

attaching the second containment means to the second support structure.

33. An automobile bumper assembly comprising:
a first plate assembly attached to an automobile frame,
a second plate assembly attached to a bumper, and
a plurality of cavernous members of an elastic material;

5 wherein the first plate assembly and the second plate assembly together form at least one cavity having an initial volume in which the plurality of cavernous members exist;

wherein shock and vibration passing between the bumper and the automobile frame cause the first plate assembly and the second plate assembly to move relative to each other to reduce the initial volume of the at least one cavity so as to compress the plurality of 10 cavernous members; and

wherein compressing the plurality of cavernous members exerts pressure against the first plate assembly and the second plate assembly so as to absorb the shock and vibration.

34. A seismic isolation assembly comprising:

a first plate assembly attached to a building foundation,
a second plate assembly attached to a building frame,
a primary positioning system having a first end in contact with the first plate assembly and a second end in contact with the second plate assembly, and
a plurality of elastic members;

wherein the first plate assembly and the second plate assembly together form at least one cavity having an initial volume in which the plurality of elastic members exist;

wherein the first end and the second end the primary positioning system press against the first plate assembly and the second plate assembly to maintain the initial volume of the at least one cavity;

wherein the primary positioning system provides a preloaded resistance against the 25 first plate assembly and the second plate assembly so as to prevent relative movement between the first plate assembly and the second plate assembly when the primary positioning system experiences forces weaker than the preloaded resistance;

wherein seismic shock and vibration passing between the building foundation and the building frame create forces on the primary positioning system greater than the preloaded 30 resistance, overcoming resistance of the primary positioning system between the first plate assembly and the second plate assembly, allowing the first plate assembly and the second plate assembly to move relative to each other to reduce the initial volume of the at least one cavity so as to compress the plurality of elastic members; and

wherein compressing the plurality of elastic members exerts pressure against the first plate assembly and the second plate assembly so as to absorb the seismic shock and vibration.

35. A track system comprising at least one track, each at least one track having a corner post to be fixedly attached to a first structure and a sliding rail to be attached to a second structure, the sliding rail slidably engaging the corner post, whereby the second structure may slide linearly with respect to the first structure.

36. The system of claim 35, wherein the corner post includes an interior groove, the interior groove having angular sides and an opening to an exterior side of the corner post, the opening being narrower than the interior groove is wide.

37. The system of claim 36, wherein the at least one track includes at least one truck assembly attached to the sliding rail and mounted within the interior groove, the at least one truck assembly forming an adjustable interface between the sliding rail and the corner post.

38. The system of claim 37, wherein the at least one truck assembly includes a truck and a truck adjuster positioned against the truck, the truck adjuster serving to center the truck in the interior groove.

39. The system of claim 38, wherein:

the truck adjuster forms a wedge;

the truck has two wings having angular mating surfaces substantially complementary to the angular sides of the interior groove, the wings having between them a space suitably sized and shaped to receive the truck adjuster; and,

the truck assembly with the truck adjuster wedged between the two wings substantially complements the cross-sectional geometry of the interior groove.

40. The system of claim 39, wherein:

the angular sides are machined flat at a side angle relative to a centerline of the interior groove, and

the angular mating surfaces are slightly rounded and splayed from the centerline by a mating angle complementary to the side angle;

whereby each angular mating surface contacts a complementary angular side with a mating area of less than a total area of the angular mating surface.